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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/572,379	03/16/2006	Kevin M Brunson	1241153	1016

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EXAMINER	
WHITTINGTON, KENNETH	

ART UNIT	PAPER NUMBER
2862	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/572,379	BRUNSON ET AL.	
	Examiner	Art Unit	
	Kenneth J. Whittington	2862	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-27 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-7 and 12-27 is/are rejected.

7)☒ Claim(s) 8-11 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 16 March 2006 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date 3/16/06.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

The following guidelines illustrate the preferred layout for the specification of a utility application. These guidelines are suggested for the applicant's use.

Arrangement of the Specification

As provided in 37 CFR 1.77(b), the specification of a utility application should include the following sections in order. Each of the lettered items should appear in upper case, without underlining or bold type, as a section heading. If no text follows the section heading, the phrase "Not Applicable" should follow the section heading:

(a) TITLE OF THE INVENTION.
(b) CROSS-REFERENCE TO RELATED APPLICATIONS.
(c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT.
(d) THE NAMES OF THE PARTIES TO A JOINT RESEARCH AGREEMENT.
(e) INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC.
(f) BACKGROUND OF THE INVENTION.
    (1) Field of the Invention.
    (2) Description of Related Art including information disclosed under 37 CFR 1.97 and 1.98.
(g) BRIEF SUMMARY OF THE INVENTION.
(h) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).
(i) DETAILED DESCRIPTION OF THE INVENTION.
(j) CLAIM OR CLAIMS (commencing on a separate sheet).
(k) ABSTRACT OF THE DISCLOSURE (commencing on a separate sheet).
(l) SEQUENCE LISTING (See MPEP § 2424 and 37 CFR 1.821-1.825. A "Sequence Listing" is required on paper if the application discloses a nucleotide or amino acid sequence as defined in 37 CFR 1.821(a) and if the required "Sequence Listing" is not submitted as an electronic document on compact disc).

Abstract

Applicant is reminded of the proper language and format for an abstract of the disclosure. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details. The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

The abstract of the disclosure is objected to because:

in lines 1 and 8, it contains terms that can be implied, i.e., "is described",

in lines 2, 3, 5 and 6, it contains legal phraseology, i.e., "means" and "said", and

in line 2, "an" before member should be "a".

Correction is required in each instance. See MPEP § 608.01(b).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-5, 7, 13, 15-17, 21 and 23-26 are rejected under 35 U.S.C. 102(b) as being anticipated by Kadar (Integrated Resonant Magnetic Field Sensor).

Regarding claim 1, Kadar discloses a resonant magnetometer comprising:

an oscillatory member (See Kadar Chapt. 2, FIGS. 2.1, 2.2 and 2.3, note silicon plate) and

means for passing an alternating current (AC) through said oscillatory member (See FIGS. 2.1-2.3, note current I and see Chapt. 2, page 2, lines 1-10),

wherein a driver is additionally provided to impart a magnetic field independent oscillatory force to said oscillatory member (See FIGS. 2.1-2.3 note feedback capacitors, also shown as inside capacitors of FIG. 2.2 and see Chapt. 2, carryover paragraph from pages 2-3).

Regarding claim 2, Kadar discloses a sensor for providing an electrical output signal dependent on the deflection of the

oscillatory member (See FIGS. 2.1-2.3, note sense capacitors, also shown as outside capacitors in FIG. 2.2).

Regarding claim 3, Kadar discloses the driver comprises a positive feedback circuit for receiving the electrical signal produced by the sensor (See circuitry shown in FIG. 2.3).

Regarding claim 4, Kadar discloses the driver provides an oscillatory force of fixed amplitude (See FIG. 2.3 and disclosure related thereto, note feedback amplifier would provide a fixed amplitude signal to capacitors based on feedback loop, which is applied as a force to the feedback capacitive plates as force to the oscillatory member. See also Chapt. 2, pages 12-20).

Regarding claim 5, Kadar discloses the driver is arranged to impart an oscillatory force to the oscillatory member of adjustable amplitude, wherein the amplitude of the oscillatory force applied by the driver is adjusted during use so as to maintain a given amplitude of oscillation of the oscillatory member (See Chapt. 2, pages 12-20).

Regarding claim 7, Kadar discloses the sensor comprises at least one sensor electrode located on the substrate and having a variable capacitance with the oscillatory member (See FIGS. 2.2, note capacitive electrodes located on the substrate and plate).

Regarding claim 13, Kadar discloses at least one drive electrode formed on the substrate to electrostatically impart the oscillatory force to the oscillatory member (See FIGS. 2.1-2.3, note inner capacitive electrodes to impart capacitive feedback forces to the plate).

Regarding claim 15, Kadar discloses the oscillatory member comprises a resonant beam (See FIGS. 2.1-2.3, note plate).

Regarding claim 16, Kadar discloses the oscillatory member comprises at least two flexible leg portions, said AC being passed through at least one of said at least two flexible leg portions (See FIGS. 2.1 and 2.2, note supports of oscillating plate flex to allow for torsional deflection of plate and note the current passing there through).

Regarding claim 17, Kadar discloses the oscillatory member comprises a substantially rigid cross-beam arranged substantially perpendicular to, and interconnecting, said at least two leg portions (See FIGS. 2.1 and 2.2, note silicon plate connected between supports as shown).

Regarding claim 21, Kadar discloses the oscillatory member comprises at least one stress reliever (See FIGS. 2.1 and 2.2, note supports flexing to allow torsional movement of the plate).

Regarding claim 23, Kadar discloses the magnetometer formed as a micro-electromechanical system (MEMS) (See Chapt. 2, pages 1-5).

Regarding claim 24, Kadar discloses the substrate and oscillatory member comprise silicon (See FIG. 2.2, note structures and materials therefor).

Regarding claim 25, Kadar discloses the substrate and oscillatory member are formed from any one of a silicon-on-insulator (SOI) wafer and a silicon-on-glass (SOG) wafer (See FIG. 2.2, note structures and materials therefor and see also Chapter 4).

Regarding claim 26, Kadar discloses an inertial measurement unit comprising at least one magnetometer according to claim 1 (See discussion of Kadar disclosing the features of claim 1 above).

Claims 1, 14 and 16-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Funk et al. (US6486665), hereinafter Funk. Regarding claim 1, Funk discloses a magnetometer comprising:

an oscillatory member (See FIG. 2, item 2) and

means for passing an alternating current (AC) through said oscillatory member (See FIG. 2, items 7 and magnetic field in

conjunction with driver 20 and 70, which during an oscillatory movement of coil 2 causes an AC current in the coil 2),

wherein a driver is additionally provided to impart a magnetic field independent oscillatory force to said oscillatory member (See FIG. 2, note driver which supplies the sinusoidal voltage to items 20 and 70 causes the means to impart an oscillatory force to item 2, see also col. 4, lines 34-39).

Regarding claim 14, Funk discloses the driver comprising a plurality of first elongate drive electrodes formed on the substrate and the oscillatory member comprises a plurality of second elongate drive electrodes, wherein the first elongate drive electrodes are interdigitated with the second elongate drive electrodes (See FIG. 2, items 20 and 70 and see col. 4, lines 4-7).

Regarding claim 16, Funk discloses the oscillatory member comprises at least two flexible leg portions, said AC being passed through at least one of the leg portions (See FIGS. 1 and 2, items 2).

Regarding claim 17, Funk discloses the oscillatory member comprises a substantially rigid cross-beam arranged substantially perpendicular to, and interconnecting, said at least two leg portions (See FIGS. 1 and 2, items 3 and 3').

Regarding claim 18, Funk discloses the cross-beam comprises a plurality of elongate electrodes protruding perpendicularly therefrom (See FIG. 2, items 20).

Regarding claim 19, Funk discloses the means for passing an alternating current (AC) through the oscillatory member is arranged to supply a differential AC voltage to said leg portions such that said cross-beam receives the desired polarisation voltage (See FIGS. 1 and 2 and col. 4, line 54 to col. 5, line 48, note that the AC current induced by oscillation of beams 2 are created on opposite sides of the coil in different directions with respect to the magnetic field, which create a differential measurement).

Regarding claim 20, Funk discloses the oscillatory member is arranged to oscillate along an axis in a plane parallel to the plane of the substrate (See FIGS. 1 and 2 and col. 4, lines 4-53).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at

> the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 6 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadar in view of Richards et al. (US7064541), hereinafter Richards. Regarding claim 6, Kadar teaches the features noted above, but not a feedback loop in the means for passing the AC signal. Richards discloses resonant magnetometer comprising an oscillatory bar supplied with an AC current comprising a means for passing an AC through the oscillatory member comprises a feedback circuit arranged to receive the electrical output signal produced by the sensor (See Richards FIG. 3, note feedback from sensed signal to VCO 102, which supplies AC current to magnetometer 101). It would have been obvious at the time the invention was made to incorporate the feedback loop from the output signal to the AC current generator for the oscillating bar as taught in Richards into the circuit of Kadar. One having ordinary skill in the art would have done so to correct for deviations in the resonant frequency (See Richards col. 3, line 61 to col. 4, line 7).

Regarding claim 12, the noted combination teaches the means for passing an AC through the oscillatory member includes means to vary the amplitude of said AC (See Richards col. 4, lines 36-47).

Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Funk in view of Pinson (US5920012). Regarding this claim, Funk teaches the features of claims 1 and 20 as noted above. However, Funk does not teach any strain relief measures for the oscillating beam. Pinson teaches a micromechanical inertial sensor having resonant oscillating members each connected via beams 26 (See Pinson FIG. 1, note oscillating members 20 and 16 moving laterally via flexible beams 26) and further placing stress relieving sections into the flexing beams 26 (See Pinson stress relieving structures 60 and 160 in FIGS. 4 and 5). It would have been obvious at the time the invention was made to incorporate the stress relieving structures of Pinson into the oscillating beams of Funk. One having ordinary skill in the art would have done so to impart lengthwise compliance to the beams and allow for large bending deflections of the beams (See Pinson col. 5, lines 34-65).

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadar in view of Hansen et al. (US5953683), hereinafter Hansen. Regarding this claim, Kadar teaches the features noted above with respect to a single magnetic field sensor in a single direction, but not to three orthogonal

directions. Hansen teaches providing three magnetic field sensors oriented along three orthogonal axes (See Hansen FIG. 1, note items 13, 15 and 17 along x, y and z directional axes). It would have been obvious at the time the invention was made to incorporate three sensors in Kadar to measure a magnetic field along three orthogonal axes. One having ordinary skill in the art would have done do to sense the direction of the Earth's magnetic field and to determine azimuth and roll of a system with respect to Earth's magnetic field (See Hansen col. 3, lines 14-30).

Allowable Subject Matter

Claims 8-11 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: regarding these claims, the prior art does not show or teach the elongate electrodes on the oscillatory member and the substrate interdigitated as recited in the claims, and in combination with the other features of the claims.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US6819103 and US6215318 each disclose varying designs for resonant magnetometers.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kenneth J. Whittington whose telephone number is (571) 272-2264. The examiner can normally be reached on Monday-Friday, 7:30am-4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Assouad can be reached on (571) 272-2210. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kenneth J Whittington
Examiner
Art Unit 2862

kjw